NUI Galway
OÉ Gaillimh

Autumn Examinations 2014 / 2015

Exam Code(s)	4BCT, 4BLE1, 4BN1,4BP1
Exam(s)	B.Sc. Degree (Computer Science and Information Technology) Bachelor of Engineering (Electrical & Electronic) Bachelor of Engineering (Electronic) Bachelor of Engineering (Electronic & Computer Engineering)
Module Code(s)	CT417
Module(s)	Software Engineering III
Paper No.	I
External Examiner(s)	Dr. John Power
Internal Examiner(s)	Prof. G. Lyons Dr. Michael Madden *Dr. Jim Duggan *Dr. David O'Sullivan

Instructions:

Answer any 3 questions. All questions will be marked equally.

For Q5, please detach the final page (with your name and ID number included) and hand it up with your answer book.

Duration	2hrs
No. of Pages	6 (Including Cover Page)
Department(s)	Information Technology
Requirements	Please distribute MCQ question 5 on a separate sheet, as this must be completed and handed up along with the answer sheet.

1. (a) Describe, using examples, the following object-oriented measures:

- Weighted methods per class
- Class size

(4)

(b) For the following class, calculate the Lack of Cohesion of Methods (LCOM) measure.

```
class Account
{
   String number;
   double balance;
   double  rate = 1.21;

   public String getNumber(){ return this.number}

   public double getBalance(){return this.balance}

  public void credit (double amt)
  {
      this.balance+=amt
  }

  public void debit (double amt)
  {
      this.balance-=amt
  }

 public double convertEuroToDollars(amt)
 {
    return amt*this.rate
 }

}
```

(12)

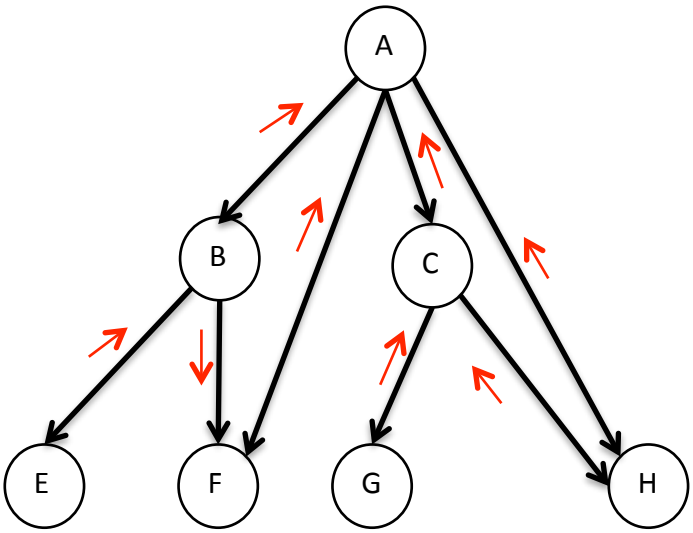
(c) Does the result fairly represent how cohesive this class is?

Discuss the strengths and weaknesses of the LCOM approach.

(4)

2. (a) Consider the following module call graph, which models the inter-module relationships and information sharing between modules. Based on this, calculate the following measures:

- System morphology (size, depth, width, edge-to-node ratio)
- Tree impurity measure
- Internal reuse measure



(12)

(b) Based on the following additional information, calculate the standard *information flow complexity* (ICC) for modules {A, B, and C }.

Module	LOC
A	200
B	15
C	300

(5)

(c) Comment on the overall expected quality of design.

(3)

3. (a) Assuming the classic reliability function based on the exponential

probability density function (pdf):

$$f(t) = \lambda e^{-\lambda t}$$

Show (no need to derive) the functions for the

- CDF, $F(t)$
- Reliability function, $R(t)$.

(6)

(b) A software system fails on average once every eight weeks. Assuming a probability density function based on the exponential distribution, calculate:

- the hazard rate of the system,
- the probability that the system will fail in the first week of operation.
- the reliability of the system after 12 weeks of operation.

(8)

(c) Define the main assumption underlying the Jelinski-Moranda (JM) model of software reliability. Clearly show the formulation for the hazard rate.

Assuming the initial number of faults (N) in the system is 8, predict the MTTF for the system after each successive system repair. Assume that $\phi = 0.005$, where ϕ is the contribution of each fault to the failure rate.

Plot the sequence of MTTF values and comment on the shape of the plot.

What aspect of the JM model makes it more suited to modelling software instead of hardware systems?

(6)

4. (a) Draw flowgraphs for the following structures:

- D_o (A,X) – Selection Statement
- D_1 (A,X,Y) – Selection statement
- D_2 (A,X) – While statement
- D_3 (X,A) – Repeat until statement

(8)

(b) Consider the following set of edges and nodes.

edges (1,2), (2,3), (3,4), (4,3), (3,5)

edges (1,2), (2,3), (2,5), (3,4), (4,1)

For each graph:

(1) Draw a flow graph

(2) Draw a decomposition tree

(3) Calculate the depth of nesting

(12)

Question 5

Place a mark inside the shaded area and beside the **one** correct answer to all the questions below.
When complete please **detach this page** and **hand-up** with your answer book.

Print Your Name: _____ Print Your Student ID: _____

1.	**Which one of the following is not a SWOT category?**	Strengths		Weaknesses		Competitors		Opportunities	
2.	**Stakeholders do not typically include which one of the following?**	Employees		Customers		Suppliers		Performance	
3.	**Which one of the following is not a strategic thrust in the Balanced Scorecard technique?**	Learning and Growth		Finance		Strategies		Customers	
4.	**Which of the following is the odd one out?**	Ideas come from everywhere		Creativity loves constraints		Set individual expectations		Don't take risks	
5.	**Which of the following is the best example of a performance indicator?**	Reduce absenteeism by 3%		Metric		Leading Indicator		Reduce Costs	
6.	**Choose the best example of a 'leading' indicator**	Defects/Unit		Customer Rating		Revenue Generated		Annual Sales	
7.	**Deborah Amabile defines creativity as including which one of the following?**	Fantasy		Imagination		Ingenuity		Motivation	
8.	**Which of the following is the least common tool used for idea creation:**	Voting		Cause-effect diagrams		Matrices		Salary Negotiation	
9.	**Brainstorming involves which one of the following:**	Wild Ideas		Safe Ideas		Mindlessness		No Ideas	
10.	**Project management is more about which one of the following?**	Managing a group of tasks		Managing organizational goals		Ranking a portfolio of projects		Keeping everyone busy	
11.	**Quantifying risks involves which one of the following?**	Monitoring progress very closely		Severity		Number of Tasks		Generating actions that eliminate risks	
12.	**A project costs 100k and generates revenue of 100k with no additional annual costs. The payback is:**	Zero		One Year		Ten Years		Added Value	
13.	**Which of the following is not an approach to portfolio management?**	Minimizing value of portfolio		Creating right mix of projects		Maximizing goal alignment		Optimizing resources	
14.	**Which of the following is not a typical leadership skill?**	Listening		Avoiding		Delivering		Enabling	
15.	**When defining team structures, which is the odd one out?**	Effective team		Lightweight team		Heavyweight team		Functional team	
16.	**Change and innovation applies to which one of the following types of organization?**	Hospitals		Colleges		Business		All	
17.	**Which one of the following best defines innovation?**	Creating something new that has never existing before		Generating ideas that can add value		Invention and exploitation		Project Management	
18.	**When describing the diffusion curve, which one of the following is not a key group of customers?**	Early Adopters		Late Majority		Laggards		Customers	
19.	**Which of the following is not a driver of innovation?**	Late Majority		Emerging Technologies		Competitor Actions		Customer Demands	
20.	**Kotter mentions eight steps. Which is the odd one out?**	Urgency		Vision		Communications		Success	